

**STATEMENT OF BASIS  
CENTRAL WEBER SEWER IMPROVEMENT DISTRICT  
RENEWAL PERMIT: DISCHARGE, BIOSOLIDS & STORM WATER  
UPDES PERMIT NUMBER: UT0021911  
UPDES BIOSOLIDS PERMIT NUMBER: UTL-021911  
UPDES MULTI-SECTOR STORM WATER GENERAL PERMIT NUMBER: UTR000000  
MAJOR MUNICIPAL**

**FACILITY CONTACTS**

Person Name:	Lance Wood	Person Name:	Jeff Kirkman
Position:	General Manager	Position:	Plant Superintendent
Person Name:	Kevin Hall	Person Name:	Brett Nelson
Position:	Technical Director	Position:	Pretreatment Coordinator
Facility Name:	Central Weber Sewer Improvement District		
Address:	2618 West Pioneer Road Ogden, Utah 84404		
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**DESCRIPTION OF FACILITY**

Originally placed in service in 1959, the Central Weber Sewer Improvement District (CWSID) uses a single-stage trickling filter treatment process with chlorination and dechlorination. In 2011 an upgrade was completed of the treatment plant that increased the capacity of the treatment plant to 69.5 MGD. The upgrade is a parallel activated sludge treatment plant. The upgrade included a new headwork's facility, raw sludge pump station, two primary clarifiers, aeration basins with a blower building, four secondary clarifiers, a chlorine contact basin, a dechlorination building, two anaerobic digesters with a digester control building, a sludge thickening building, and a 9 foot diameter effluent pipeline to the weber river. The facility serves the area including the towns of Farr West, Hooper, Harrisville, North Ogden, Ogden, Pleasant View, Marriott-Slaterville, Riverdale, South Ogden, West Haven, South Weber, Washington Terrace, Weber County and portions of Plain City, Roy and Uintah. The facility is located at latitude **41°16'18"** and longitude **112°02'49"**.

**SUMMARY OF CHANGES FROM PREVIOUS PERMIT**

Changes to the discharge from Outfalls 001 and 002 are due to new wasteload analysis (WLA) and the increase in permitted flow, which is a result of the upgrade of the treatment plant. Due to the increase in permitted flow the facility has completed an anti-degradation review which is included in the permit attachments. The WLA includes changes to the water quality standards and steam standards for the Weber River and the Warren Canal.

CWSID was granted a flow varied discharge for Outfalls 001 and 002. The discharge will be monitored for flow which will be required to be monitored continuously with a flow meter at the effluent. The WLA Addendum includes details regarding the flow variations.

## DISCHARGE

### DESCRIPTION OF DISCHARGE

<u>Outfall</u>	<u>Description of Discharge Point</u>
001	Located at latitude 41°16'18" and longitude 112°02'49". The discharge from Outfall 001 flows into the Weber River and finally the Great Salt Lake.
002	The discharge from Outfall 002 flows into the Warren Canal, which is tributary of the Great Salt Lake. It may also discharge back into the Weber River through a downstream controlled overflow gate.

### RECEIVING WATERS AND STREAM CLASSIFICATION

The Warren Canal is classified as a Class 4 water and the Weber River is classified as a Class 2B, 3C, 3D, and 4 water according to *Utah Administrative Code (UAC) R317-2-13*:

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 3D	Protected for waterfowl, shore birds and other water oriented wildlife not included in Class 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.
Class 4	Protected for agricultural uses including irrigation of crops and stock watering.

### BASIS FOR EFFLUENT LIMITATIONS

Limitations on total suspended solids (TSS), biochemical oxygen demand (BOD<sub>5</sub>), E-coli and pH are based on current Utah Secondary Treatment Standards, *UAC R317-1-3.2*. A variance for the percent removal requirements of TSS and BOD<sub>5</sub> will be continued from the previous permit. In accordance with *UAC R317-1-3.E*, this variance was granted based on the low influent concentration, which is due to inflow and infiltration (I/I), and the infeasibility of the removal of that I/I based on cost of the removal. The oil and grease limit is based on best professional judgment (BPJ).

Total residual chlorine (TRC), ammonia, dissolved oxygen (DO), copper and mercury limits are determined by wasteload analysis, which is attached. The permit limitations are stated in the following tables.

The facility will be required to test for chronic toxicity. This is because acute toxicity will be detected in the chronic biomonitoring test and the permittee has consistently passed acute testing in the past. If chronic toxicity occurs that might be or is believed to be due to an acute toxicity failure, then the facility may be required to test for acute toxicity as per the Directors requirements. The Chronic WET must pass with an IC<sub>25</sub> of > 75% effluent.

In order for the limits below to be applicable the following conditions must be met:

No discharge is allowed from Outfall 001.

Flow from the Warren Canal may and/or is being returned to the Weber River.

Outfall 002				
Parameter	Effluent Limitations a/			
	Monthly Average	Maximum Weekly Average	Daily Minimum	Daily Maximum
Flow	69.5	NA	NA	NA
BOD <sub>5</sub> , mg/L	25	35	NA	NA
TSS, mg/L	25	35	NA	NA
Ammonia, mg/L				
Summer	9.57	NA	NA	38.57
Fall	9.27	NA	NA	28.35
Spring	11.17	NA	NA	38.90
Winter	9.06	NA	NA	30.65
DO, mg/L	NA	NA	5.5	NA
TRC, mg/L				
Summer	2.508	NA	NA	3.711
Fall	0.293	NA	NA	0.412
Spring	0.616	NA	NA	0.906
Winter	0.180	NA	NA	0.263
Oil & Grease, mg/L	NA	NA	NA	10
Mercury, mg/L	0.000021	NA	NA	0.0038
Copper, mg/L	0.064	NA	NA	0.090
E-coli	126	158	NA	NA
pH, Standard Units	NA	NA	6.5	9.0

NA – Not Applicable

This is scenario 1(a) in the wasteload analysis addendum.

In order for the limits below to be applicable the following conditions must be met:

No discharge is occurring from Outfall 001.

Flow from the Warren Canal to the Weber River is not greater than 25 MGD.

Outfall 002				
Parameter	Effluent Limitations a/			
	Monthly Average	Maximum Weekly Average	Daily Minimum	Daily Maximum
Flow	69.5	NA	NA	NA
BOD <sub>5</sub> , mg/L	25	35	NA	NA
TSS, mg/L	25	35	NA	NA
Ammonia, mg/L				
Summer	10.86	NA	NA	38.35
Fall	11.01	NA	NA	28.97
Spring	13.17	NA	NA	40.25
Winter	10.53	NA	NA	30.99
DO, mg/L	NA	NA	5.0	NA
TRC, mg/L				
Summer	3.180	NA	NA	4.292
Fall	0.396	NA	NA	0.501
Spring	0.788	NA	NA	1.054
Winter	0.233	NA	NA	0.308
Oil & Grease, mg/L	NA	NA	NA	10
Mercury, mg/L	0.000026	NA	NA	0.0038
Copper, mg/L	0.0807	NA	NA	0.1036
E-coli	126	158	NA	NA
pH, Standard Units	NA	NA	6.5	9.0

NA – Not Applicable

This is scenario 1(b) in the wasteload analysis addendum.

The limits below are applicable if all of the flow from the WWTP is being discharged to the Weber River from Outfall 001.

Outfall 001, Design Flow 69.5 MGD				
Parameter	Effluent Limitations a/			
	Monthly Average	Maximum Weekly Average	Daily Minimum	Daily Maximum
Flow, MGD	69.5	NA	NA	NA
BOD <sub>5</sub> , mg/L	25	35	NA	NA
TSS, mg/L	25	35	NA	NA
Ammonia, mg/L				
Summer	4.62	NA	NA	19.63
Fall	6.43	NA	NA	20.45
Spring	6.35	NA	NA	22.95
Winter	6.42	NA	NA	27.78
DO, mg/L	NA	NA	5.0	NA
TRC, mg/L	0.017	NA	NA	0.024
Oil & Grease, mg/L	NA	NA	NA	10
Mercury, mg/L	0.000017	NA	NA	0.003
Copper, mg/L	0.053	NA	NA	0.072
E-coli	126	158	NA	NA
pH, Standard Units	NA	NA	6.5	9.0

NA – Not Applicable

This is scenario 2 in the wasteload analysis addendum.

In order for the limits below to be applicable the following conditions must be met:

The flow from Outfall 001 must not exceed a daily maximum of 30 MGD.  
Flow from the Warren Canal is not being returned to the Weber River.

Outfall 001, Daily Average Flow 25 MGD and Outfall 002, Daily Average Flow 44.5				
Parameter	Effluent Limitations a/			
	Monthly Average	Maximum Weekly Average	Daily Minimum	Daily Maximum
Flow, MGD e/ Outfall 001	25	NA	NA	30
Outfall 002	44.5	NA	NA	NA
BOD <sub>5</sub> , mg/L	25	35	NA	NA
TSS, mg/L	25	35	NA	NA
Ammonia, mg/L				
Summer	6.05	NA	NA	20.05
Fall	9.04	NA	NA	21.92
Spring	8.94	NA	NA	25.36
Winter	8.80	NA	NA	24.08
DO, mg/L	NA	NA	5.0	NA
TRC, mg/L	0.027	NA	NA	0.033
Oil & Grease, mg/L	NA	NA	NA	10
Mercury, mg/L	0.000027	NA	NA	0.0042
Copper, mg/L	0.085	NA	NA	0.085
E-coli	126	158	NA	NA
pH, Standard Units	NA	NA	6.5	9.0

NA – Not Applicable

This is scenario 3(a) in the wasteload analysis addendum.

In order for the limits below to be applicable the following conditions must be met:

The flow from Outfall 001 must not exceed a daily maximum of 30 MGD.  
Flow from the Warren Canal to the Weber River is 44.5 MGD.

Outfall 001, Daily Average Flow 25 MGD and Outfall 002, Daily Average Flow 44.5				
Parameter	Effluent Limitations a/			
	Monthly Average	Maximum Weekly Average	Daily Minimum	Daily Maximum
Flow, MGD e/ Outfall 001	25	NA	NA	30
Outfall 002	44.5	NA	NA	NA
BOD <sub>5</sub> , mg/L	25	35	NA	NA
TSS, mg/L	25	35	NA	NA
Ammonia, mg/L				
Summer	6.04	NA	NA	20.10
Fall	8.30	NA	NA	21.98
Spring	9.06	NA	NA	25.38
Winter	8.34	NA	NA	24.00
DO, mg/L	NA	NA	5.0	NA
TRC, mg/L	0.027	NA	NA	0.033
Oil & Grease, mg/L	NA	NA	NA	10
Mercury, mg/L	0.000021	NA	NA	0.0038
Copper, mg/L	0.063	NA	NA	0.088
E-coli	126	158	NA	NA
pH, Standard Units	NA	NA	6.5	9.0

NA – Not Applicable

This is scenario 3(b) in the wasteload analysis addendum.

The Chronic WET must pass with an IC<sub>25</sub> of > 75% effluent for all discharge scenarios. For additional information regarding WET see Part I of the permit or the Biomonitoring Requirements section of this document.

### SELF-MONITORING AND REPORTING REQUIREMENTS

The permit will require reports to be submitted monthly and quarterly, as applicable, on DMR forms due 28 days after the end of the monitoring period. Lab sheets for biomonitoring, quarterly metals and organic toxics must be attached to the DMR.

The monitoring for metals and organic toxics will increase, this is due to the increase in the design flow at the treatment facility. Metals will be required to be sampled for every two months. The organic toxics will be required to be sampled every six months. This sampling frequency is

consistent with the “Region VII Guidance for Determining Monitoring Frequencies for the Pretreatment Program” dated October 15, 1998. The sampling for mercury and copper will be reduced to every two months consistent with the guidance. The sampling for the other parameters is consistent with the “Monitoring, Recording and Reporting Guidelines for Municipal Wastewater Treatment Facilities” developed by the Division of Water Quality and revised on December 1, 1991.

Self-Monitoring and Reporting Requirements Outfall 001 and 002			
Parameter	Frequency	Sample Type	Units
Total Flow	Continuous	Recorder	MGD
BOD <sub>5</sub> , Influent Effluent	Daily	Composite	mg/L
	Daily	Composite	mg/L
TSS, Influent Effluent	Daily	Composite	mg/L
	Daily	Composite	mg/L
Ammonia	Daily	Grab	mg/L
DO	Daily	Grab	mg/L
TRC	Daily	Grab	mg/L
WET, Chronic Biomonitoring	Quarterly	Composite	Pass/Fail
Oil & Grease	Monthly	Grab	mg/L
Mercury	6 X Yearly	Grab	mg/L
Copper	6 X Yearly	Composite	mg/L
E-coli	Daily	Grab	#/ 100 mL
pH	Daily	Grab	SU
Metals, Influent Effluent	6 X Yearly	Composite	mg/L
	6 X Yearly	Composite	mg/L
Organic Toxics, Influent Effluent	2 X Yearly	Grab	mg/L
	2 X Yearly		

### TMDL

The Great Salt Lake is currently undergoing intensive study to develop numeric water quality criteria and address several water quality concerns including eutrophication (excess nutrient loading). Since the Great Salt Lake ultimately receives the effluent from Central Weber's treatment plant, the Division strongly recommends that Central Weber begin planning and evaluating alternatives for nutrient control treatment processes, specifically for nitrogen and phosphorus. As part of this evaluation, regular sampling and analysis of nutrients of the facility's influent and effluent are recommended to characterize the extent of treatment that will likely be required to protect and maintain the Great Salt Lake's aquatic ecosystem. If a TMDL is developed for the lower Weber River, CWSID's permit will be reevaluated to determine if additional requirements are necessary.

## BIOSOLIDS

### **DESCRIPTION OF TREATMENT AND DISPOSAL**

The solids are stabilized in a primary anaerobic digester and secondary anaerobic digester with a combined mean cell residence time of 82 days at an average temperature of 35° C (95° F). After stabilization the biosolids are de-watered with a belt press to about seventeen percent solids.

After de-watering the biosolids are either composted to meet Class A standards, or treated with the “two-summer method” to produce Class A biosolids. In 2012, the CWSID sold or gave away 3,138 dry metric tons (DMT) of composted biosolids, and sold or gave away 281 DMT of the “two summer method” of biosolids, for a total of 3,419 DMT of Class A biosolids sold or given away in 2012.

### **SELF-MONITORING REQUIREMENTS**

Under *40 CFR 503.16(a)(1)*, the self-monitoring requirements are based upon the amount of biosolids disposed per year and shall be monitored according to the chart below.

<b>Minimum Frequency of Monitoring Based Upon Dry Metric Tons (DMT)</b>	
<b>Amount of Biosolids Produced Per Year</b>	<b>Monitoring Frequency</b>
> 0 to < 290 DMT	Once Per Year
> 290 to < 1,500 DMT	Four Times Per Year
>1,500 to <15,000 DMT	Six Times Per Year

In 2012, the CWSID produced a total of 3,419 DMT, therefore the CWSID will be required to sample at least six times per year, at the time of sale or giveaway.

#### Landfill Monitoring

Prior to disposal in a landfill all biosolids must pass a paint filter test (to determine if the biosolids exhibit free liquid). If the solids do not pass a paint filter test, the biosolids cannot be disposed of in the landfill under *40 CFR 258.2(3)(c)(1)*.

#### Metals Monitoring

The CWSID is required to sample for metals prior to the time of disposal if the biosolids are land applied or sold or given away to the public.

#### Pathogen Monitoring for Class A Biosolids (Compost)

The biosolids must be sampled prior to the time of sale or giveaway for *salmonella* or *fecal coliform* under *40 CFR 503.32*.

#### Pathogen Monitoring for Class A Biosolids (Two Summer Method)

The biosolids must be sampled prior to the time of sale or giveaway for *salmonella* or *fecal coliform*, and enteric viruses under *40 CFR 503.32*.

### Vector Attraction Reduction Monitoring

The biosolids must be monitored for moisture reduction or use another means of meeting a requirement for vector attraction reduction under *40 CFR 503.33*.

## **LIMITATIONS**

### Metals

If the biosolids are to be land applied to home lawns and gardens, the biosolids need to be sampled and meet the metals limits of *Table 3, 40 CFR 503.13* for the biosolids to be considered Class A exceptional quality (EQ) biosolids with respect to metals. The practice of sale or giveaway to the public is an acceptable use of biosolids of this quality as long as the biosolids continue to meet EQ standards. If the biosolids do not meet EQ standards for metals, *Tables 1, 2, or 4 of 40 CFR 503.13* will need to be met if the Class B biosolids are to be land applied. However, since all biosolids produced from the CWSID have met EQ standards during the life of the last permit, it is expected that the CWSID will continue to meet the EQ standards of *Table 3* during the life of this permit. If the biosolids fail to meet any of the metals standards of *40 CFR 503.13*, the biosolids will need to be land filled.

### Pathogens Class A Biosolids (Compost)

If biosolids are to be considered Class A biosolids, the biosolids need to be treated by a process to further reduce pathogens (PFRP), and meet a microbiological limit of less than 1,000 most probable number (MPN) of fecal coliform per gram of total solids (or less than 3 MPN of *Salmonella* per 4 grams of total solids) to be considered Class A biosolids. The PFRP will be accomplished through a method of composting (*40 CFR 503.32(a)*) (*Appendix B4*). The practice of sale or giveaway to the public is an acceptable use of biosolids of this quality as long as the biosolids continue to meet Class A standards with respect to pathogens. If the biosolids do not meet Class A pathogen standards the CWSID cannot sell or give away the biosolids to the public and will need to find another method of disposal.

### Pathogens Class A Biosolids (Two Summer Method)

If biosolids are to be considered Class A biosolids, the biosolids need to be treated by a PFRP, and meet a microbiological limit of less than 1,000 MPN of fecal coliform per gram of total solids (or less than 3 MPN of *Salmonella* per 4 grams of total solids) and a microbiological limit of less than 1 plaque forming unit of enteric virus per 4 grams of biosolids under *40 CFR 503.32*. The PFRP will be accomplished through the two summer method (this method has been approved by the EPA Pathogen Equivalency Committee). The practice of sale or giveaway to the public is an acceptable use of biosolids of this quality as long as the biosolids continue to meet Class A standards with respect to pathogens. If the biosolids do not meet Class A pathogen standards the CWSID cannot sell or give away the biosolids to the public and will need to find another method of disposal.

### Vector Attraction Reduction

The CWSID needs to meet a method of vector attraction reduction (VAR) if the biosolids are land applied. The CWSID intends to meet VAR under *40 CFR 503.33(b)(1)* (*at least a 38% reduction in volatile solids during treatment*).

## MONITORING DATA 2012

### Heavy Metals

The CWSID was required to sample for heavy metals at least six times in 2012. They sampled twelve times. The monitoring results show that the CWSID meets *Table 3 of 40 CFR 503* (EQ Standards).

Table 1, CWSID Heavy Metals Monitoring Data 2012

Parameter	Table 3 (EQ), mg/kg	Average, mg/kg	Maximum, mg/kg
Arsenic	41.0	24.2	28
Cadmium	39.0	1.8	2.26
Copper	1500.0	833	1120
Lead	300.0	540	58.9
Mercury	17.0	2.0	3.43
Molybdenum	75.0	10.9	15.5
Nickel	420.0	35.68	56.7
Selenium	36.0	9.5	12.2
Zinc	2,800.0	1558	1920

### Pathogens

The CWSID uses two disposal methods to produce Class A biosolids for sale or giveaway to farmers and the public. Each disposal method requires sampling for pathogens prior to sale or giveaway. The results of both of those disposal methods are below.

### Compost

The CWSID was required to sample for Pathogens in the compost at least six times in 2012. They sampled twelve times. The monitoring results show that the CWSID meets the Class A standards for pathogens.

Table 2, CWSID Pathogen Monitoring Data for Compost 2012

Parameter	Permit Limits	CWSID, Fecal Coliform Geometric Mean
	Must be less than one thousand most probable number per gram of total solids	
Fecal Coliform	<1000/MPNg	35 MPN/g

### Two Summer Method

The CWSID was required to sample for Pathogens from the "Two Summer Method" at least four times in 2012. They sampled six times. The monitoring results of those six samples show that the CWSID met the Class A standards for pathogens.

Table 3, CWSID Pathogen Monitoring Data for the Two Summer Method 2012

<b>Parameter</b>	<b>Permit Limits</b> Must be less than one thousand most probable number per gram of total solids	<b>Fecal Coliform Geometric Mean</b>	<b>Viable Helminth Ova</b>
Fecal Coliform	<1000/MPNg	35 MPN/g	0.0

## **RECORD KEEPING**

The record keeping requirements from *40 CFR 503.17* are included under Part II.F. of the permit. The amount of time the records must be maintained are dependent on the quality of the biosolids in regards to the metals concentrations. If the biosolids continue to meet *Table 3 of 40 CFR 503.13*, and are land applied, the records must be retained for a minimum of five years. If the biosolids are land applied, and do not meet the metals limits of *Table 3 of 40 CFR 503.13*, and meet *Tables 1 2, or 4 of 40 CFR 503.13*, the records must be kept indefinitely.

## **REPORTING**

The CWSID is required to report annually as required in *40 CFR 503.18*. This report is to include the results of all monitoring performed in accordance with Part I.C. of the permit, information on management practices, land application sites, and certifications and will be due no later than February 19 of each year. Each report is for the previous calendar year.

## **STORM WATER**

Storm water provisions are included in this combined UPDES permit.

The storm water requirements are based on the UPDES Multi-Sector General Permit for Storm Water Discharges for Industrial Activity, General Permit No. UTR000000 (MSGP). All sections of the MSGP that pertain to discharges from wastewater treatment plants have been included and sections which are redundant or do not pertain have been deleted.

The permit requires the preparation and implementation of a storm water pollution prevention plan for all areas within the confines of the plant. Elements of this plan are required to include: 1. The development of a pollution prevention team: 2. Development of drainage maps and materials stockpiles: 3. An inventory of exposed materials: 4. Spill reporting and response procedures: 5. A preventative maintenance program: 6. Employee training: 7. Certification that storm water discharges are not mixed with non-storm water discharges: 8. Compliance site evaluations and potential pollutant source identification, and: 9. Visual examinations of storm water discharges.

## **PRETREATMENT REQUIREMENTS**

The permittee has an approved industrial pretreatment program. Any changes to the program must be submitted to the Division of Water Quality. Authority to require a pretreatment program is provided for in *19-5-108 UCA, 1953 ann.* and *UAC R317-8-8*.

The permittee will be required to perform an annual evaluation to determine the need to revise or develop technically based local limits to implement the general and specific prohibitions of *40 CFR, Part 403.5(a)* and *Part 403.5(b)*. This evaluation may indicate that present local limits are sufficiently protective, or that they must be revised. As part of this evaluation, the permit requires influent and effluent monitoring for metals and organic toxics monitoring listed in *R317-8-7.5* and sludge monitoring for potential pollutants listed in *40 CFR 503*. All metals testing must use a low enough MDL to insure that the metals are not above the allowable levels determined by the WLA for this permittee, a summary can be found in Part VI.H. of the permit. If a test is not available then the lowest test available must be used.

Because of violations of Water Quality Standards on the Weber River CWSID has developed a Mercury Control Strategy as part of their pretreatment program. This program is included in Part IV. I. of CWSID permit.

## **BIOMONITORING REQUIREMENTS**

As part of a nationwide effort to control toxic discharges, biomonitoring requirements are being included in permits for facilities where effluent toxicity is an existing or potential concern. In Utah, this is done in accordance with the *State of Utah Permitting and Enforcement Guidance Document for Whole Effluent Toxicity (WET) Control (Biomonitoring [2/1991])*. Authority to require effluent biomonitoring is provided in *Utah Pollutant Discharge Elimination System UAC R317-8*, and, *Water Quality Standards UAC R317-2*.

Since the permittee is a major municipal discharger, with a significant pretreatment program the renewal permit will require whole effluent acute and chronic limits with chronic toxicity testing. It is anticipated that the chronic testing will not only indicate chronic toxicity, but also screen for acute toxicity. The permit contains toxicity reopener language.

No chronic toxicity will be allowed in the effluent of this discharger. The tests shall alternate each quarter between *Ceriodaphnia dubia* and *Pimephales promelas* (fathead minnow). The permit will contain the standard requirements for follow-up testing upon failure of a WET test and a Toxicity Reduction Evaluation (TRE) as necessary.

**PERMIT DURATION**

It is recommended that this permit be effective for a duration of five (5) years.

Drafted on December 19, 2013 by

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Utah Division of Water Quality

PND DRAFT