



State of Utah

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DIVISION OF WATER QUALITY  
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Director

**MEMORANDUM**

TO: Daniel Griffin, Permit Writer

FROM: Chris Bittner, Standards Coordinator

DATE: December 4, 2020

SUBJECT: Antidegradation Reviews for the North Davis Sewer District (NDS)  
UPDES Permit UT0021741 Renewal  
Outfalls 001 and 003

The NDS has proposed to construct and operate a new outfall, 003 to meet the requirements of R317-1-3.3, Technology-based Limits for Controlling Phosphorus Pollution. Outfall 003 will discharge to Gilbert Bay and will have sufficient capacity to provide the option of eliminating discharges from Outfall 001 that discharges to Farmington Bay. The antidegradation reviews included herein include both outfalls.

The Level I anti-degradation reviews are conducted in accordance with the *Interim Methods for Evaluating Use Support for Great Salt Lake Utah Pollution Discharge Elimination System (UPDES) Permits* (v. 1.0 January 4, 2016). The Level II anti-degradations reviews are based on the requirements of UAC R317-2-3. The whole effluent toxicity (WET) requirements are based on the *Utah Pollutant Discharge Elimination System Permit and Enforcement Guidance Document for Whole Effluent Toxicity (DWQ, February, 2018)*.

As described in the *Interim Methods*, effluent pollutant concentrations were screened against Class 3D aquatic life numeric criteria to identify parameters requiring further analyses to determine “reasonable potential” and ensure protection of the uses.

**Antidegradation Reviews for Outfall 001**

**Outfall 001 Receiving Waters and Designated Uses:**

**Unnamed Drainage Ditch (R317-2-13.10)**

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 3E: Severely habitat-limited waters. Narrative standards will be applied to protect these waters for aquatic wildlife;

to:

**Class 5E Transitional Waters, Great Salt Lake (R317-2-13.11)**

Protected for infrequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain;

to:

**Class 5D Farmington Bay, Great Salt Lake (R317-2-13.11)**

Protected for infrequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain.

Utah's secondary treatment requirements (R317-1-3) are judged to be sufficient to protect the recreational uses. Consistent with the Narrative Standards (R317-2-7.2), the aquatic life in the drainage ditch is protected from acute toxicity. The aquatic life in the Class 5E and 5D waters is protected from both acute and chronic adverse effects. No dilution was assumed for the effluent in the receiving waters. Flow measurements attempted by the NDSO indicate that flows in the drainage ditch are insignificant or zero under limiting conditions. Beyond the mixing zones allowable under R317-2-5, some dilution likely occurs in the Class 5E waters and occurs in the downstream Class 5D open waters of Farmington Bay.

Effluent concentrations were compared to Class 3D aquatic life criteria and the results for metals and metalloids is shown in Table 1. With the exception of ammonia, chromium, copper, free cyanide, and total residual chlorine, no other pollutants were identified for further evaluation using the reasonable potential analyses. These pollutants are discussed in the following section.

**Outfall 001 Pollutants of Concern**

*Ammonia*

The ammonia screening limits are based on the most recent scientific data presented for the 2013 EPA ammonia water quality criteria. For the NDSO, the criteria are based on a fresh water aquatic life community and presumed absence of unionid mussels. The potential presence of early life-stages of fish also affects the ammonia criteria. Fish are present in Farmington Bay and surrounding wetlands. NDSO discharges near the causeway between Farmington and Gilbert Bays and the

higher salinities normally present are anticipated to preclude the presence of fish. For this permit cycle, early life-stages of fish were presumed to be absent. Table 2 illustrates the screening criteria used to evaluate reasonable potential for ammonia.

For the last permit renewal, only limited data for ammonia concentrations in the effluent were available. Based on a comparison of these data with the more frequent monitoring conducted over the last 5 years, optimization efforts have decreased ammonia concentrations in the effluent markedly. However, monthly average concentrations exceed the chronic screening criteria. The maximum reported monthly average effluent concentrations were 12 mg/L in the winter, 10 mg/L in the fall, 7 mg/L in the spring, and 6 mg/L for the summer. These exceedances are more likely to affect fish, if present, than invertebrates based on the species sensitivity distribution presented in the USEPA (2013) ammonia criteria document.

#### *Chromium*

The concentrations of chromium<sup>6+</sup> exceeded the screening criterion in several effluent samples. However, comparisons of the identical reported concentrations of chromium<sup>3+</sup> and chromium<sup>6+</sup> support NDS's explanation that the reported chromium<sup>6+</sup> concentrations represent data entry errors and not effluent concentrations.

#### *Copper*

Copper concentrations in one effluent sample exceed the chronic screening criterion. At minimum, more frequent monitoring is recommended to ensure that the data are representative of effluent concentrations.

#### *Mercury*

The analytical reporting limit for one effluent sample exceeded the screening criterion of 0.000012 mg/L. The reason for the elevated analytical detection should be investigated and resolved so that future analytical results are sufficiently sensitive to compare to 0.000012 mg/L.

#### *Cyanide*

During the previous permit cycle, monitoring for free cyanide was added in addition to the existing monitoring for total cyanide. Free cyanide is the toxic form but total cyanide is often used as an initial screening method for free cyanide. The free cyanide screening criteria are 0.022 mg/L for one hour and 0.0052 mg/L for a 4-day average.

Free cyanide was infrequently detected up to a maximum concentration of 0.014 mg/L which exceeds the chronic screening criterion but not the acute criterion. Based on the infrequency of detections and that detected concentrations are relatively close to the detection limits, additional validation of sample and analytical methods are recommended. Free cyanide is toxic to a wide variety of organisms but it should be noted that no toxicity has been observed with the WET testing.

#### *Chlorine*

Total residual chlorine (TRC) is a new parameter of concern for this permit cycle. The effluent is treated with chlorine to eliminate pathogens. The one-hour screening criterion for total residual chlorine is 0.019 mg/l and the four-day criterion is 0.011 mg/L. Chlorine is toxic to a wide variety of aquatic organisms.

The maximum concentration of TRC in the effluent was reported as 2.05 mg/L and the maximum of the monthly average concentrations was 0.87 mg/L. The maximum concentration is 100-times higher than the acute screening criterion and the maximum monthly average concentration is over ten-times higher than the chronic screening criterion. The current dosing regimens should be reviewed. WET samples are routinely dechlorinated and are therefore unreliable for detecting toxicity due to chlorine.

### **Outfall 001 WET Testing**

The current WET testing, acute with chronic as an indicator, is consistent with the *Utah Pollutant Discharge Elimination System Permit and Enforcement Guidance Document for Whole Effluent Toxicity* and no changes are recommended.

### **Outfall 001 Level II Antidegradation Review**

A Level II antidegradation review is not required because water quality will not be lowered by the proposed activity, or for existing permitted facilities, water quality will not be further lowered by the proposed activity (R317-2-3.5.b.1.).

## **Antidegradation Reviews for Outfall 003**

### **Receiving Waters and Designated Uses:**

#### **Class 5A Gilbert Bay, Great Salt Lake (UAC R317-2-13.11)**

Protected for frequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain.

Utah's secondary treatment requirements (R317-1-3) are judged to be sufficient to protect the recreational uses. The Class 5A aquatic life uses are protected from both acute and chronic adverse effects. Outfall 003 is proposed to discharge to Gilbert Bay adjacent to the breach in the Antelope Island causeway. This causeway is the boundary between Farmington and Gilbert Bays. Under normal conditions, flows are out of Farmington Bay into Gilbert Bay. At times, flow directions and mixing may be more complex because of the density differences in the water between the bays, wind events, and currents in Gilbert Bay. These conditions may result in bi-directional flows between the bays and infrequent flow reversals from Gilbert Bay to Farmington Bay as indicated by monitoring at the causeway breach.

The currently available data are insufficient to support reliable dilution estimates for the proposed outfall and the Level I antidegradation review is based on no dilution. Collection of site-specific mixing zone data could be used to refine these findings. However, the potential dilution allowances under R317-2-5 are anticipated to be minimal because of the shallow water within the 200 feet of the outfall. This limits the quantity of receiving water available for dilution. Limiting conditions are

projected to be calm, stable meteorological conditions. Under calm conditions, mixing of the effluent with the receiving waters will be limited by the density differences between the effluent and Gilbert Bay.

The initial screening procedures are identical for Outfall 003 are identical to Outfall 001. The same pollutants were identified for further evaluation in the following section: ammonia, chromium, copper, free cyanide, mercury, and total residual chlorine.

### **Outfall 003 Pollutants of Concern**

#### *Ammonia*

The ammonia limits are based on the most recent scientific data presented for the 2013 EPA ammonia water quality criteria. Based on the salinities measured at the proposed location of Outfall 003, fish and early life-stages of fish are not expected to be present. The screening criteria presented in Table 1 are based on a presumed absence of unionid mussels and early life-stages of fish.

For the last permit renewal, only limited data for ammonia concentrations in the effluent were available. Based on a comparison of these data with the more frequent monitoring conducted over the last 5 years, optimization efforts have decreased ammonia concentrations in the effluent markedly. However, monthly average concentrations exceed the chronic screening criteria under the limiting condition of no dilution. The maximum reported monthly average effluent concentrations were 12 mg/L in the winter, 10 mg/L in the fall, 7 mg/L in the spring, and 6 mg/L for the summer.

The 2013 EPA ammonia screening criteria are based exclusively on freshwater species that are not present in Gilbert Bay. No data are available to specifically assess the toxicity of ammonia for the Gilbert Bay resident organisms such as brine shrimp and brine flies. Based on a comparison of EPA's recommended fresh water and marine water criteria, the toxicity of ammonia decreases in saline waters compared to fresh water and decreases in marine waters with increasing salinity. Unpublished toxicity data from the University of Notre Dame with brine shrimp suggest that this species may be more tolerant of ammonia than most aquatic organisms. While precise comparisons are not possible, the impacts of the current effluent concentrations are predicted to have less of an impact to Gilbert Bay than Farmington Bay.

#### *Chromium*

The concentrations of chromium<sup>6+</sup> exceeded the screening criterion in several effluent samples. However, comparisons of the identical reported concentrations of chromium<sup>3+</sup> and chromium<sup>6+</sup> support NDS's explanation that the reported chromium<sup>6+</sup> concentrations represent data entry errors and not effluent concentrations.

#### *Copper*

Copper concentrations in one effluent sample exceed the chronic screening criterion. Toxicity testing conducted using copper on brine shrimp and brine flies demonstrated that brine shrimp are more sensitive than brine flies. The growth no-observed-effects-concentration (NOEC) was 459 µg/L supporting that the maximum measured effluent concentration of 66 µg/L would not adversely impact the uses of Gilbert Bay.

### *Mercury*

The analytical reporting limit for one effluent sample exceeded the screening criterion of 0.000012 mg/L. The reason for the elevated analytical detection should be investigated and resolved so that future analytical results are sufficiently sensitive to compare to 0.000012 mg/L.

### *Cyanide*

During the previous permit cycle, monitoring for free cyanide was added in addition to the existing monitoring for total cyanide. Free cyanide is the toxic form but total cyanide is often used as an initial screening method for free cyanide. The free cyanide screening criteria are 0.022 mg/L for one hour and 0.0052 mg/L for a 4-day average.

Free cyanide was infrequently detected up to a maximum concentration of 0.014 mg/L which exceeds the chronic screening criterion but not the acute criterion. Based on the infrequency of detections and that detected concentrations are relatively close to the detection limits, additional validation of sample and analytical methods are recommended. Free cyanide is toxic to a wide variety of organisms but it should be noted that no toxicity has been observed with the WET testing.

### *Chlorine*

Total residual chlorine (TRC) is a new parameter of concern for this permit cycle. The effluent is treated with chlorine to eliminate pathogens. The one-hour screening criterion for total residual chlorine is 0.019 mg/l and the four-day criterion is 0.011 mg/L. Chlorine is toxic to a wide variety of aquatic organisms.

The maximum concentration of TRC in the effluent was reported as 2.05 mg/L and the maximum of the monthly average concentrations was 0.87 mg/L. The maximum concentration is 100-times higher than the acute screening criterion and the maximum monthly average concentration is over ten-times higher than the chronic screening criterion. The current dosing regimens should be reviewed. WET samples are routinely dechlorinated and are therefore unreliable for detecting toxicity due to chlorine.

## **Outfall 003 WET Testing**

The existing WET test requirements for Outfall 001 are consistent with the *Utah Pollutant Discharge Elimination System Permit and Enforcement Guidance Document for Whole Effluent Toxicity* and the same requirements are recommended for Outfall 003 based on the salinity of the effluent.

## **Level II Antidegradation Review**

Outfall 003 represents a new discharge to the Class 5A Gilbert Bay waters and a Level II antidegradation review is required.

Table 1. NDS Reasonable Potential Screening for Metals and Metalloids

	CN	Free CN	AS	Cd	Cr III	Cr VI	Cu	Pb	Ni	Si	Zn	Mo	Se	Hg	
Acute Criteria	0.022	0.022	0.1	0.007	5.612	0.016	0.0517	0.1	1.516	0.0411	0.3879		0.02	0.00015	Possible Acute Limit
Chronic Criteria	0.0052	0.0052	0.19	0.0025	0.268	0.011	0.0305	0.0186	0.169		0.3879		0.0046	0.000012	Possible Chronic Limit
Reported	CN	Free CN	As	Cd	Tot Cr	Tot Cr	Cu	Pb	Ni	Ag	Zn	Mo	Se	Hg	
Sep-15	0.0138	-	0.00911	No Det	No Det	No Det	0.00477	No Det	0.00204	0.0000391	0.0298	0.00339	0.000411	No Det	
Dec-15	0.00557	-	0.00704	No Det	No Det	No Det	0.00596	No Det	0.00166	No Det	0.0137	0.00328	0.000301	0.0000015	
Mar-16	0.0103	-	0.00758	No Det	0.00333	0.00333	0.0121	0.00264	0.00202	0.0000244	0.0258	0.00454	0.0000634	0.0000035	
Jun-16	0.0118	-	0.00667	No Det	No Det	No Det	0.00673	0.000235	0.00284	No Det	0.0229	0.00358	No Det	0.0000018	
Sep-16	No Det	-	0.0102	No Det	No Det	No Det	0.00362	No Det	0.0015	No Det	0.0165	0.00367	0.000322	No Det	
Dec-16	No Det	-	0.00765	No Det	No Det	No Det	0.00574	0.000188	0.00202	No Det	0.016	0.00419	0.000497	No Det	
Mar-17	-	0.00948	0.00889	No Det	0.000229	0.000229	0.00567	No Det	0.00192	No Det	0.0282	0.00428	0.000602	0.00000127	
Jun-17	-	0.0138	0.00755	No Det	0.00037	0.00037	0.00717	No Det	0.0017	No Det	0.0207	0.0031	0.000272	0.0000013	
Sep-17	No Det	No Det	0.0088	No Det	0.00053	0.00053	0.00668	No Det	0.00325	No Det	0.0216	0.00324	0.000419	0.0000025	
Dec-17	0.00224	0.0104	0.00748	-	0.000396	0.000396	0.00876	-	0.00264	-	0.0216	0.00358	0.000478	No Det	
Mar-18	No Det	No Det	0.00592	No Det	0.000893	0.000893	0.0046	No Det	0.0028	No Det	0.0332	0.00387	0.000333	No Det	
Jun-18	0.0157	No Det	0.00712	0.0001	0.00198	0.00198	0.00733	No Det	0.00223	No Det	0.0241	0.00316	0.000404	No Det	
Sep-18	No Det	No Det	0.0083	No Det	No Det	No Det	0.00361	No Det	0.00217	No Det	0.018	0.00277	No Det	No Det	
Dec-18	0.00884	0.00415	0.00728	No Det	No Det	No Det	0.00396	No Det	0.00202	0.000506	0.0188	0.00331	0.000461	No Det	
Mar-19	0.00784	0.005	0.00934	0.00005	0.002	0.002	0.00685	0.002	0.00161	0.002	0.0243	0.00399	0.002	0.0000012	
Jun-19	0.00784	0.005	0.00934	0.0005	0.02	0.02	0.00685	0.002	0.00161	0.002	0.0243	0.00399	0.002	0.0000012	
Sep-19	0.00854	0.00854	0.0133	0.000164	0.00407	0.00407	0.066	0.000999	0.00431	0.002	0.0672	0.00433	0.002	0.0000015	
Dec-19	0.00362	0.00362	0.00743	0.0000445	0.000956	0.000956	0.00448	0.000224	0.00282	0.000116	0.0193	0.00328	0.000287	0.000001	
Mar-20	0.0102	0.0102	0.00578	0.0005	0.002	0.002	0.00563	0.002	0.00239	0.002	0.0293	0.00326	0.002	0.000001	
Jun-20	0.0132	0.0149	0.00688	0.0005	0.002	0.002	0.0058	0.002	0.00299	0.002	0.0248	0.00422	0.002	0.00009	
Non D															
Max	0.0157	0.0149	0.0133	0.0005	0.02	0.02	0.066	0.00264	0.00431	0.002	0.0672	0.00454	0.002	0.00009	Max Reported Value
Acute? Check	Yes	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	Yes	Do I run Full RP?
Chronic? Check	Yes	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	Yes	Do I run Full RP?

- no data was included in NetDMR  
 Value above Chronic Criteria  
 Yes Full RP to be run, Limit likely.

Table 2. NDS Total Ammonia Nitrogen Screening Criteria

Season	Average Effluent pH	Average Effluent Temperature (°C)	CMC <sup>1</sup> (mg/L)	CCC <sup>2</sup> (mg/L)	CCC <sup>3</sup> (mg/L)
Winter (Jan.-March)	7.4	19.4	<b>21.3</b>	5.2	<b>5.9</b>
Spring (April-June)	7.4	21.7	<b>23</b>	5	<b>5</b>
Summer (July-Sept.)	7.4	23.4	<b>20.4</b>	4.4	<b>4.4</b>
Fall (Oct.-Dec.)	7.4	21.0	<b>24</b>	5.2	<b>5.3</b>
Notes:					
1 CMC= Criteria maximum concentration (one-hour average), USEPA (2013) no unionid mussels and no salmonids					
2 CCC= Criteria continuous concentration (4-day average); USEPA (2013) no unionid mussels, early life stages present					
3 CCC= Criteria continuous concentration (4-day average); USEPA (2013) no unionid mussels, early life stages not present					
Bold font shows criteria used for screening					