MEMORANDUM

DATE: December 29, 2022

TO: Wastewater File #6-57-15-0-07
Cedar Lake Dewatering

LOCATION: Cedar Lake
Section 16, Township 83N, Range 07W
Linn County
41° 59’ 47.8” N / 91° 40’ 53.1” W
Field Office 1, EPA Region 7

FROM: Melinda McCoy

RE: Rationale for NPDES Permit

Background

The City of Cedar Rapids is planning to construct approximately 2,200 linear feet of levee located along the west bank of Cedar Lake. This project is a component of the city’s East Side Flood Control System (FCS) located in the North Industrial Reach (NIR), also known as Reach 1. The levee will provide connection to future FCS project components, including Cedar Lake Pump Station to the north and the North Railyard Levee to the south. This connection will provide flood risk reduction from the Cedar River and allow Cedar Lake to provide the interior drainage storage needed for localized storm events occurring at the same time as Cedar River flood events.

Dewatering will need to take place as part of the levee construction project. The purpose of this rationale is to provide the supporting information for a new National Pollutant Discharge Elimination System (NPDES) permit authorizing the discharge of groundwater from thirty dewatering wells as part of the Cedar Lake levee construction project. The combined discharge flow is estimated to be 25 million gallons per day (MGD) based on an average pumping rate of 400 to 600 gallons per minute (gpm) at each well. The groundwater will discharge via outfall 001 to the Cedar River, as shown in the attached map.

Receiving Waterbody Uses

The Cedar River is an A1, B(WW-1), HH designated waterbody. A1 waters are protected for primary contact recreation where there is a considerable risk of people ingesting enough water to pose a health hazard. Examples of such activities include swimming, diving, and water-skiing. B(WW-1) waters are suitable to maintain warm water game fish populations. They are also suitable for a resident aquatic community that includes a variety of native nongame fish and invertebrate species. HH (human health) waters are those in which fish are routinely harvested for human consumption. This includes waters that are designated as a drinking water supply and in which fish are routinely harvested for human consumption.

Total Maximum Daily Loads (TMDLs)

The 2022 Integrated Report was reviewed to identify any downstream use impairments. The Cedar River and the Iowa River are identified as having an impaired primary contact recreation use due to elevated bacteria

(*Escherichia coli*). The Cedar River also has an impaired aquatic life use due to copper and due to the loss of native mussel species. The Mississippi River has an impaired aquatic life use due to aluminum.

There are two approved TMDLs in the discharge route for indicator bacteria, one for the Cedar River and one for the Iowa River. As this facility is not discharging domestic wastewater, it is not given an *E. coli* limit to match those in the TMDLs. There are no other current TMDLs downstream of the proposed discharge.

Pollutants of Concern (POCs)

Pollutants of concern for the proposed discharge from outfall 001 will be those parameters already present in the groundwater. The city does not plan to add any chemicals during the groundwater dewatering operations.

Form 2 of the city's NPDES permit application provided average and maximum results for total suspended solids (TSS), oil and grease (O&G), pH, ammonia nitrogen, iron, chloride, sulfate, and total organic carbon (TOC). These results were based on groundwater sampling conducted during 2021 and 2022. More specifically, six monitoring wells and two piezometer wells were sampled in December 2021 and analyzed for all of the aforementioned pollutants. Thirty piezometer wells (including the two previously noted) were sampled during March through May of 2022 and analyzed for ammonia nitrogen and dissolved iron. The thirty groundwater dewatering wells to be operated during the Cedar Lake levee construction project were also sampled in June 2022 and analyzed for ammonia nitrogen, dissolved iron, total iron, TSS, and TOC. The average value reported on Form 2 for any given pollutant was determined by averaging all of the available well-specific results, while the maximum value reported on Form 2 was the greatest result observed for any given well.

Due to the current and historical industrial uses in the area of Cedar Lake, the samples obtained from the six monitoring wells and two piezometer wells in December 2021 were also analyzed for various other pollutants including: metals, semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), pesticides (i.e., chlordane), total extractable hydrocarbons (TEH), and other general chemistry parameters. The samples obtained from the 30 piezometer wells during March through May of 2022 were also analyzed for VOCs. The results for these additional pollutants were discussed in an antidegradation alternatives analysis (AAA) report submitted to the Department on December 12, 2022.

Effluent Limits

There are no federal effluent limit guidelines (ELGs) or new source performance standards (NSPS) applicable to the proposed discharge. Therefore, any technology-based effluent limits (TBELs) must be developed using best professional judgment (BPJ).

Water quality-based effluent limits (WQBELs) are included in the proposed permit if there is reasonable potential for violation of the limit, unless the TBEL is more stringent than the WQBEL for a given pollutant. Several factors may be considered when determining reasonable potential. One of the most common factors used, particularly when limited data are available, is whether the maximum reported concentration is greater than 50% the limit from the WLA. Other factors are considered as necessary.

WQBELs are calculated in the attached wasteload allocation (WLA) dated October 31, 2022. The aforementioned flow of 25 MGD was used to calculate the WQBELs.

TSS and O&G

TSS concentrations of 30.5 mg/L (average) and 311 mg/L (max) and O&G concentrations of 5.1 mg/L (average) and 12.7 mg/L (max) were reported on application Form 2. Because the groundwater from the thirty dewatering wells will be combined prior to discharge via outfall 001, it is likely that discharge concentrations will be closer to the reported average values than the reported maximum values.

Iowa's water quality standards (WQS) are found in the *Iowa Administrative Code* (IAC) at 567 IAC Chapter 61. They do not include numeric water quality criteria for TSS or O&G. Therefore, the "Additional Requirements" page of the proposed permit includes a combination of narrative WQBELs and technology-based best management practices (BMPs) to control the discharge of TSS and O&G, as well as visual monitoring requirements for the proposed discharge.

The narrative WQBELs reflect the general water quality criteria found at 567 IAC 61.3(2)"a" through "e". The technology-based BMPs require the discharge to be performed in a manner to prevent or minimize erosion of soil or other materials into the Cedar River, and they require use of BMPs to prevent contamination of the discharge with fuel, lubricants, solids, or other pollutants. These requirements are the same as those required for other groundwater dewatering discharges covered under Iowa's general permit no. 9 (GP9), and they represent the best available technology for minimizing the discharge of TSS and O&G.

pH

The pH levels reported on application Form 2 ranged from 7.0 to 7.6 standard units (s.u.). The WQBEL calculated in the WLA dated October 31, 2022, is a range of 6.0 to 14.0 s.u. Based on the available groundwater sampling data and given that the city does not plan to add any chemicals during the groundwater dewatering operations, there is no reasonable potential for the proposed discharge to cause or contribute to a WQS violation for pH. Therefore, no numeric WQBELs are included in the proposed permit for pH. The aforementioned narrative WQBELs and technology-based BMPs should be sufficient to regulate the pH of the proposed discharge.

Ammonia nitrogen

Ammonia nitrogen concentrations of 4.1 mg/L (average) and 13.1 mg/L (max) were reported on application Form 2. The WLA dated October 31, 2022, calculated average and maximum WQBELs for ammonia nitrogen for each month of the year using monthly critical low flow values instead of an annual critical low flow. The average and maximum WQBELs both range from 5.6 mg/L in December to 12.9 mg/L in June.

Based on the concentrations reported on Form 2, there is reasonable potential for the proposed discharge to cause or contribute to a WQS violation for ammonia nitrogen, and WQBELs based on the WLA are included in the proposed permit. However, the ammonia nitrogen concentrations in the proposed discharge are likely to be closer to the average value reported on Form 2 than the maximum. And, the AAA report submitted on December 12, 2022, notes that contractors will have the ability to shut down pumping from individual wells if needed to maintain discharge water quality within permit limits. For these reasons, the proposed discharge should be able to meet the proposed WQBELs for ammonia nitrogen.

Iron

Total iron concentrations of 5.3 mg/L (average) and 40.9 mg/L (max) were reported on application Form 2. Based on lab reports submitted with the permit renewal application, the dissolved iron concentrations were 0.42 mg/L (average) and 6.5 mg/L (max).

The city also submitted results from an acute whole effluent toxicity (WET) test conducted on September 21, 2022, using *Ceriodaphnia dubia* and a mixture consisting of 17% river water and 83% composite groundwater with spiked total iron concentrations up to 10 mg/l. The results were submitted on October 21, 2022, and they showed 100% survival for *C. dubia* at the highest total iron concentration, with dissolved iron being non-detects (<0.036 mg/l).

The WLA dated October 31, 2022, included WQBELs for total iron which are equal to 10 mg/L (average and max) based on the aforementioned WET test results. The WLA also calculated average and maximum WQBELs for dissolved iron for each month of the year using monthly critical low flow values. In each month, the average and maximum WQBELs are the same. They range from 1.19 mg/L in December to 2.7 mg/L in June.

Based on the available groundwater sampling results, there is reasonable potential for the proposed discharge to cause or contribute to a WQS violation for iron. Therefore, WQBELs for both total and dissolved iron based on the WLA are included in the proposed permit. However, the iron concentrations in the proposed discharge are likely to be closer to the average values of 5.3 mg/L (total iron) and 0.42 mg/L (dissolved iron) than to the maximum values. And, the AAA report submitted on December 12, 2022, notes that contractors will have the ability to shut down pumping from individual wells if needed to maintain discharge water quality within permit limits. For these reasons, the proposed discharge should be able to meet the proposed WQBELs for iron (total and dissolved).

Chloride and Sulfate

Chloride concentrations of 60 mg/L (average) and 85.9 mg/L (max) and sulfate concentrations of 132 mg/L (average) and 440 mg/L (max) were reported on application Form 2. These results are well below the chloride WQBELs of 717 mg/L (average and max) and the sulfate WQBELs of 1,730 mg/L (average and max) calculated in the WLA dated October 31, 2022. Therefore, there is no reasonable potential for the proposed discharge to cause or contribute to a WQS violation for chloride or sulfate, and no WQBELs are included in the proposed permit for these two pollutants.

TOC

TOC is a measure of the amount of organic carbon in water. TOC concentrations of 5.1 mg/L (average) and 29.2 mg/L (max) were reported on application Form 2. Iowa's WQS do not include numeric water quality criteria for TOC, and the reported concentration is low enough that there is likely not an efficient option for further treatment. Therefore, the proposed permit does not include limits for TOC.

Remaining Pollutants

As previously described, some of the groundwater samples collected in 2021 and 2022 were analyzed for additional pollutants including: metals, SVOCs, VOCs, PCBs, chlordane, TEH, and other general chemistry parameters. Page 2-1 of the AAA report submitted to the Department on December 12, 2022, describes the

results for these additional pollutants. It states: “Except for iron and ammonia…all remaining pollutants in the discharge…are not anticipated to have reasonable potential to cause or contribute to an excursion above any state water quality standard.” The AAA report indicates that this determination was made after comparing the results to 50% of the WQBELs calculated in the WLA dated October 31, 2022. Since there is no reasonable potential for the proposed discharge to cause or contribute to a WQS violation for the remaining pollutants, no WQBELs are included in the proposed permit for these pollutants.

Effluent Monitoring Requirements

Effluent monitoring frequencies for ammonia nitrogen and iron at outfall 001 were initially evaluated based on the *Supporting Document for Permit Monitoring Frequency Determination* (“Supporting Document”) cited at 567 IAC 63.3. The Supporting Document considers the toxicity of the pollutant (group), existing monitoring data (potential), and the ratio of effluent flow to stream flow (flow). Each of these is given a rating which determines the category, or recommended minimum monitoring frequency. The permit writer has discretion to adjust this as needed.

For both pollutants, the group rating was 1, the potential rating was 5, and the flow rating was 2. Therefore, the Supporting Document recommended a minimum effluent monitoring frequency of once every two weeks to once per month. However, the Department is proposing a once per week effluent monitoring frequency for both ammonia nitrogen and iron (total and dissolved) based on BPJ given the variability of the concentration results obtained from the groundwater sampling conducted in 2021 and 2022 and to ensure that several effluent sample results are available each month for comparison to the monthly average limits. Weekly sampling should also be helpful to contractors for evaluating whether any individual wells need to be shut down in order to maintain discharge water quality within permit limits.

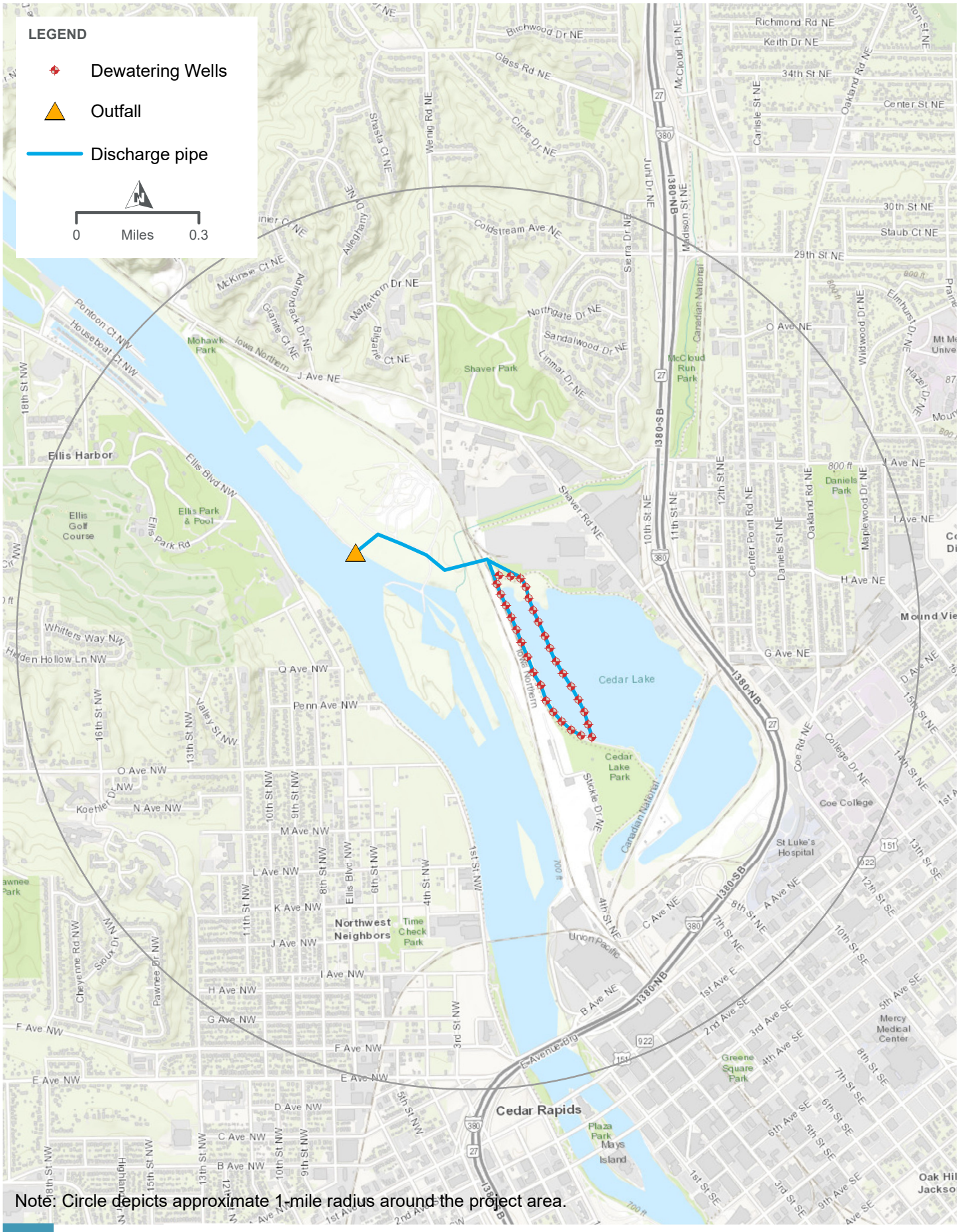
For physiochemical parameters such as flow, the Supporting Document requires monitoring at the same frequency as the most frequently monitored pollutant. Therefore, the proposed permit requires effluent flow monitoring at a frequency of once per week.

The proposed permit requires visual monitoring of the discharge at least three (3) times per week, with results to be documented in writing. Appendix 1 of the proposed permit provides guidance for performing the visual monitoring, and Appendix 2 provides a log sheet for recording the results of the visual monitoring.

Antidegradation & Backsliding

According to the Iowa Antidegradation Implementation Procedure, new or expanded regulated activities are subject to antidegradation review requirements. As previously noted, the AAA report for the proposed discharge was submitted to the Department on December 12, 2022. The Department approved the analysis in the attached letter dated December 29, 2022. Therefore, the antidegradation review is satisfied.

CWA sections 303(d)(4) and 402(o) and implementing regulations at 40 CFR 122.44 contain anti-backsliding provisions. Since this is a new NPDES permit, backsliding is not occurring. This permit will set the baseline for the anti-backsliding review during any future permit modifications or renewals, although a renewal is unlikely given the temporary nature of the levee construction project.



Note: Circle depicts approximate 1-mile radius around the project area.

HDR

CEDAR RAPIDS
City of Five Seasons

CEDAR LAKE LEVEE DEWATERING PROJECT

FORM 1. NO. 15 - LOCATION MAP

Cedar Lake Dewatering Project

This Package Contains

WASTELOAD ALLOCATION CALCULATIONS & NOTES

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY-BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Cedar Lake Dewatering Project — Sewage File Number: None

Parameters	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Mass (lbs/d)	Max. Mass (lbs/d)
Outfall No. 001	**ADW = 25 MGD & AWW = 25 MGD**			
Ammonia - Nitrogen				
January	8.4	8.4	1743.5	1743.5
February	10.6	10.6	2217.3	2217.3
March	9.7	9.7	2025.3	2025.3
April	8.9	8.9	1850.2	1850.2
May	12.4	12.4	2585.6	2585.6
June	12.9	12.9	2700.1	2700.1
July	10.2	10.2	2123.4	2123.4
August	7.9	8.9	1650.1	1851.5
September	6.7	6.8	1403.6	1415.3
October	6.6	6.6	1375.0	1375.0
November	6.6	6.6	1379.5	1379.5
December	5.6	5.6	1170.4	1170.4
Chloride	717	717	149,580	149,580
Iron (Dissolved)				
January	1.20	1.20	251	251
February	1.27	1.27	264	264
March	1.40	1.40	293	293
April	1.89	1.89	394	394
May	2.17	2.17	453	453
June	2.27	2.27	472	472
July	1.78	1.78	371	371
August	1.55	1.55	324	324
September	1.44	1.44	301	301
October	1.40	1.40	292	292
November	1.40	1.40	293	293
December	1.19	1.19	249	249
Iron (Total Recoverable)	10.0	10.0	2,085	2,085
Sulfate	1,730	1,730	360,634	360,634
TEH_{diesel}	0.044	16.98	9.202	3,540
$TEH_{waste\ oil}$	0.995	57.0	208	11,883
pH	6.0-14.0 Standard Units			

Stream Network/Classification of Receiving Stream: Cedar River (A1, B(WW-1), HH)

Annual critical low flows in Cedar River at the outfall:
1Q10 flow 329 cfs, 7Q10 flow 439 cfs, 30Q10 flow 503 cfs, 30Q5 flow 675 cfs, harmonic mean flow 1,878 cfs

Performed by: Alex Martin

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY-BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Cedar Lake Dewatering Project — Sewage File Number: 6-None

Parameters	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Mass (lbs/d)	Max. Mass (lbs/d)
Outfall No. 001	**ADW = 25 MGD & AWW = 25 MGD**			
Toxics				
1,1,1-Trichloroethane	3.033E+01	3.033E+01	6.324E+03	6.324E+03
1,1-Dichloroethylene	6.204E+01	6.204E+01	1.294E+04	1.294E+04
1,2-Dichloroethane	3.514E+00	6.778E+01	7.327E+02	1.413E+04
1,2-Dichloropropane	1.425E+00	1.425E+00	2.970E+02	2.970E+02
2,3,7,8-TCDD (Dioxin)	4.844E-10	4.844E-10	1.010E-07	1.010E-07
3,3-Dichlorobenzidine	2.659E-03	2.659E-03	5.545E-01	5.545E-01
4,4' DDT	2.986E-06	1.264E-03	6.227E-04	2.635E-01
Aldrin	4.749E-06	3.447E-03	9.901E-04	7.186E-01
Aluminum	2.658E+00	2.872E+00	5.542E+02	5.988E+02
Antimony	2.595E+00	1.264E+01	5.410E+02	2.635E+03
Arsenic (III)	3.906E-01	3.906E-01	8.144E+01	8.144E+01
Barium	2.355E+02	2.355E+02	4.910E+04	4.910E+04
Benzene	4.844E+00	1.896E+01	1.010E+03	3.952E+03
Benzo(a)Pyrene	1.710E-03	1.710E-03	3.565E-01	3.565E-01
Beryllium	5.744E-01	5.744E-01	1.198E+02	1.198E+02
Bis(2-ethylhexyl)phthalate	2.090E-01	2.090E-01	4.357E+01	4.357E+01
Bromoform	1.330E+01	1.330E+01	2.772E+03	2.772E+03
Cadmium	4.102E-03	6.715E-03	8.553E-01	1.400E+00
Carbon Tetrachloride	1.520E-01	2.476E+01	3.168E+01	5.162E+03
Chlordane	1.284E-05	2.757E-03	2.677E-03	5.749E-01
Chlorobenzene	6.487E+00	1.850E+01	1.353E+03	3.857E+03
Chlorodibromomethane	1.235E+00	1.235E+00	2.574E+02	2.574E+02
Chloroform	4.464E+01	4.464E+01	9.307E+03	9.307E+03
Chloropyrifos	9.536E-05	9.536E-05	1.988E-02	1.988E-02
Chromium (VI)	1.872E-02	1.872E-02	3.903E+00	3.903E+00
Copper*	1.687E-02	2.690E-02	3.517E+00	5.608E+00
Cyanide	1.553E-02	2.528E-02	3.238E+00	5.270E+00
Dichlorobromomethane	1.615E+00	1.615E+00	3.366E+02	3.366E+02
Dieldrin	5.129E-06	2.757E-04	1.069E-03	5.749E-02
Endosulfan	1.672E-04	2.528E-04	3.487E-02	5.270E-02
Endrin	9.880E-05	9.880E-05	2.060E-02	2.060E-02
Ethylbenzene	8.514E+00	2.602E+01	1.775E+03	5.426E+03
Fluoride	9.242E+00	9.242E+00	1.927E+03	1.927E+03
gamma-Hexachlorocyclohexane (Lindane)	1.091E-03	1.091E-03	2.276E-01	2.276E-01
Heptachlor	7.503E-06	5.974E-04	1.564E-03	1.246E-01

* “End-of-pipe” limits due to aquatic life use impairment for copper on the receiving segment of the Cedar River

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY-BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Cedar Lake Dewatering Project — Sewage File Number: 6-None

Parameters	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Mass (lbs/d)	Max. Mass (lbs/d)
Outfall No. 001	**ADW = 25 MGD & AWW = 25 MGD**			
Toxics				
Heptachlor epoxide	3.704E-06	5.974E-04	7.723E-04	1.246E-01
Hexachlorobenzene	2.754E-05	2.754E-05	5.743E-03	5.743E-03
Hexachlorocyclopentadiene	4.460E+00	4.460E+00	9.299E+02	9.299E+02
Lead	2.297E-02	2.268E-01	4.790E+00	4.729E+01
Mercury (II)	6.081E-04	1.892E-03	1.268E-01	3.945E-01
Nickel	2.800E-01	9.689E-01	5.838E+01	2.020E+02
Nitrate as N	3.676E+02	3.676E+02	7.665E+04	7.665E+04
Nitrate+Nitrite as N	2.986E+02	3.676E+02	6.227E+04	7.665E+04
para-Dichlorobenzene	7.703E-01	2.298E+00	1.606E+02	4.791E+02
Parathion	3.882E-05	7.468E-05	8.095E-03	1.557E-02
Pentachlorophenol (PCP)	3.347E-02	3.347E-02	6.979E+00	6.979E+00
Phenols	1.493E-01	2.872E+00	3.113E+01	5.988E+02
Polychlorinated Biphenyls (PCBs)	6.079E-06	2.298E-03	1.267E-03	4.791E-01
Polynuclear Aromatic Hydrocarbons (PAHs)	8.959E-05	3.447E-02	1.868E-02	7.186E+00
Selenium	1.493E-02	2.217E-02	3.113E+00	4.623E+00
Silver	1.432E-02	1.432E-02	2.986E+00	2.986E+00
Tetrachloroethlyene	3.134E-01	3.134E-01	6.535E+01	6.535E+01
Thallium	1.906E-03	6.870E-01	3.973E-01	1.432E+02
Toluene	1.493E-01	2.872E+00	3.113E+01	5.988E+02
Total Residual Chlorine (TRC)	2.183E-02	2.183E-02	4.551E+00	4.551E+00
Toxaphene	5.973E-06	8.387E-04	1.245E-03	1.749E-01
trans-1,2-Dichloroethylene	5.676E-01	5.676E-01	1.183E+02	1.183E+02
Trichloroethylene (TCE)	2.389E-01	4.595E+00	4.981E+01	9.582E+02
Vinyl Chloride	2.279E-01	2.279E-01	4.753E+01	4.753E+01
Zinc	2.477E-01	2.477E-01	5.164E+01	5.164E+01

WLAs/Permit Limits for Cedar Lake Dewatering Project's Wastewater Discharge

These wasteload allocations and water quality-based permit limitations are for Cedar Lake Dewatering Project's wastewater discharge. The wasteload allocations/permit limits are based on the Water Quality Standards (IAC 567.61) and the "Iowa Wasteload Allocation (WLA) Procedure," effective November 11, 2020. The chloride allocation/permit limits are based on the criteria that became effective on November 11, 2009.

The water quality-based limits in this WLA are calculated to meet the surface water quality criteria to protect downstream uses. There could be technology-based limits applicable to this facility that are more stringent than the water quality-based limits shown in this WLA. The technology-based limits could be derived from either federal guidelines based on different industrial categories or permit writer's judgment.

1. BACKGROUND:

Cedar Lake Dewatering Project proposes discharging a stream of wastewater dewatering wells into the Cedar River (at 41° 59' 47.8" N, 91° 40' 53.1" W).

Route of flow and use designations:

The Cedar River is an A1, B(WW-1), HH designated use waterbody. The designations have been adopted in Iowa's state rule described in the rule-referenced document of "Surface Water Classification," effective July 24, 2019. Based on the pollutants of concern, the use designations of waterbodies further downstream will not impact the resulting limits for this facility.

Critical low flow determination:

The annual critical low flows in the Cedar River at the outfall are estimated based on the Weighted Drainage Area Ratio (WDAR) method from "Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa" (2012, revised 2017) and flow statistics obtained at USGS gage station 05464500, located on the Cedar River at Cedar Rapids, Iowa.

Table 1: Annual critical low flows

Location	D.A. (mi^2)	1Q10 (cfs)	7Q10 (cfs)	30Q10 (cfs)	30Q5 (cfs)	Harmonic mean (cfs)
Cedar River at the outfall	6,490	329	439	503	675	1,878
Cedar River at the USGS gage 05464500	6,510	329	440	504	677	1,880

The monthly critical low flows in the Cedar River at the outfall (Table 2) are estimated based on the Drainage Area Ratio (DAR) method from "Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa" (2012, revised 2017) and flow statistics obtained at USGS gage station 05464500, located on the Cedar River at Cedar Rapids, Iowa (Table 3). There flows are used for the monthly ammonia limits.

Table 2: Monthly critical low flows at the outfall

Month/Flow	1Q10 (cfs)	7Q10 (cfs)	30Q10 (cfs)	30Q5 (cfs)	Harmonic mean (cfs)
January	451	602	747	1,037	2,681
February	591	694	966	1,371	2,718
March	895	1,093	2,527	3,565	2,758
April	1,962	2,061	3,106	4,352	2,768
May	2,589	2,753	4,232	5,514	2,774
June	2,797	3,055	4,320	5,874	2,771
July	1,726	1,928	2,728	3,780	2,764
August	1,221	1,361	1,646	2,063	2,753
September	976	1,025	1,210	1,520	2,748
October	885	914	1,125	1,469	2,779
November	895	1,116	1,372	1,734	2,779
December	424	703	1,039	1,325	2,777

Table 3: Monthly critical low flows at USGS gage 05464500

Month/Flow	1Q10 (cfs)	7Q10 (cfs)	30Q10 (cfs)	30Q5 (cfs)	Harmonic mean (cfs)
January	453	604	749	1,040	2,689
February	592	696	969	1,376	2,727
March	898	1,097	2,534	3,576	2,767
April	1,968	2,068	3,116	4,365	2,776
May	2,597	2,762	4,245	5,531	2,783
June	2,806	3,065	4,333	5,892	2,780
July	1,732	1,934	2,737	3,791	2,772
August	1,224	1,366	1,651	2,069	2,762
September	979	1,028	1,214	1,525	2,757
October	888	917	1,128	1,473	2,788
November	898	1,120	1,376	1,740	2,788
December	426	705	1,042	1,329	2,786

Zone of initial dilution (ZID) and mixing zone (MZ):

The discharge is approximately 1,400 feet from the juncture of two perennial streams. According to 567 IAC 61.2(4) “b”(2)6 and “e”(2)6, the mixing zone is limited to a maximum distance of 2,000 feet for toxics and ammonia nitrogen. However, it must be restricted if the distance to the juncture of two perennial streams is within 2,000 feet of the point of discharge 567 IAC 61.2(4) “b” (2)1. and “e” (2)1. As previously stated, the facility discharges directly to the Cedar River, which is a perennial stream. Approximately 1,400 feet downstream from the discharge, McLoud Run flows into the Cedar River. McLoud Run is also a perennial waterbody. Therefore, the mixing zone length must be restricted to 1,400 feet for toxics and ammonia nitrogen. Thus, for toxics and ammonia the MZ and ZID percentages are proportionately reduced to 70% (1,400/2,000) of their default values. This does not apply to pH, thus the default MZ and ZID are used in the calculations for pH.

The wasteload allocation shall use 17.5% of the flow in the MZ and 1.75% of the flow in the ZID in the calculation of effluent water quality-based limits for toxics and ammonia.

2. TOTAL MAXIMUM DAILY LOAD (TMDL) LIMITATIONS:
The following waterbodies in the discharge route are on the 2022 impaired waters list:

- Cedar River for bacteria (indicator bacteria – *E. coli*), metals (copper), and biological (loss of native mussel species)
- Iowa River for bacteria (indicator bacteria – *E. coli*)
- Mississippi River for metals (aluminum)

There are two approved TMDLs in the discharge route for indicator bacteria, one for the Cedar River and one for the Iowa River. As this facility is not discharging domestic wastewater, it is not given an *E. coli* limit to match those in the TMDLs. There are no other current TMDLs downstream of the proposed discharge.

The results presented in this report are wasteload allocations based on meeting the State's current water quality standards in the receiving waterbody. Additional and/or more stringent effluent limits may be applicable to this discharge based on approved TMDLs for impaired waterbodies, which may provide watershed based wasteload allocations. Information on impaired streams in Iowa and approved TMDLs can be found at the following website: http://www.iowadnr.gov/Environmental-Protection/Water-Quality/Watershed-Improvement/Impaired-Waters.

3. CALCULATIONS:
The WLAs/permit limits for this outfall are calculated based on the facility's Average Dry Weather (ADW) flow of 25 MGD and its Average Wet Weather (AWW) flow of 25 MGD.

Only wasteload allocations/permit limits (water quality-based effluent limits) calculated using DNR approved design flows can be applied in NPDES permits. Water quality-based effluent limits calculated using proposed flows that have not been approved by the DNR for permitting and compliance may be used for informational purposes only.

The water quality-based permit concentration limits are derived using the allowed stream flow and the ADW flow, while the loading limits are derived using the allowed stream flow and the AWW flow.

Toxics and TRC:
The toxics wasteload allocations will consider the procedures included in the 2000 revised WQS and the 2007 chemical criteria.

To protect the aquatic life use:
Important to toxics is the use of the 1Q10 stream flow in association with the acute wasteload allocation calculation. The chronic WLA will continue to use the 7Q10 stream flow in its calculations. In this case, 17.5% of the 7Q10 flow and 1.75% of the 1Q10 flow in the Cedar River at the outfall are used as the MZ and the ZID, respectively.

Effective November 11, 2020, water quality criteria for metals (excluding aluminum) are expressed as dissolved in IAC 567.61. Using EPA dissolved metal translators, water quality-based effluent limits in this WLA are expressed as total recoverable.

Effective November 11, 2020, water quality criteria for aluminum are expressed as bioavailable in IAC 567.61. Water quality-based effluent limits for aluminum in this WLA are expressed as total recoverable.

Copper note:
The receiving segment of the Cedar River is impaired for aquatic life use – copper. There is no assimilative capacity for copper in the receiving segment of the Cedar River. Thus, the copper criteria apply at "end-of-pipe."

To protect the human health (HH) use:
For pollutants that are non-carcinogenic and have criteria for HH protection, the criteria apply at the end of the MZ, which in this case is 17.5% of the 30Q5 flow in the Cedar River at the outfall.

For pollutants that are carcinogenic and have criteria for HH protection, the criteria apply at the end of the MZ, which in this case is 17.5% of the harmonic mean flow in the Cedar River at the outfall.

Final limits:
The maximum limits are those calculated for the protection of the aquatic life use and the average limits are the more stringent between those for the protection of the aquatic life use and those for the protection of the HH use.

The TRC limits are based on a sampling frequency of 1/week; the limits for other toxics are based on a sampling frequency of 1/week.

Ammonia Nitrogen:
Standard stream background pH, temperatures, and concentrations of NH3-N are mixed with the discharge from the facility's effluent pH and temperature values to calculate the applicable instream criteria for the protection of the Cedar River.

Based on the ratio of the stream flow to the discharge flow and the shortened MZ due to the juncture of two perennial streams, 1.75% of the monthly 1Q10 flows and 17.5% of the monthly 30Q10 flows in the Cedar River at the outfall are used as the ZID and the MZ, respectively. The Cedar River is a B(WW-1) stream; therefore, early life protection will begin in March and run through September.

The monthly background pH, temperatures, and NH3-N concentrations shown in Table 4 are used for the wasteload allocation/permit limits calculations based on the Year 2000 ammonia nitrogen criteria. Table 5 shows the statewide monthly effluent pH and temperature values for facilities with ambient conditions. Table 6 shows the calculated ammonia nitrogen wasteload allocations for this facility.

Table 4: Background pH, temperatures, and NH3-N concentrations for use with Year 2000 ammonia nitrogen criteria

Months	pH	Temperature (°C)	NH_3-N (mg/l)
January	8.1	0.3	0.02
February	8.0	0.1	0.08
March	8.1	1.5	0.12
April	8.3	9.3	0.03
May	8.2	15.0	0.03
June	8.2	19.4	0.02
July	8.2	23.5	0.02
August	8.2	24.3	0.02
September	8.3	20.2	0.02
October	8.3	14.2	0.02
November	8.3	8.0	0.02
December	8.3	0.8	0.03

Table 5: Standard effluent pH and temperature values for facilities with ambient conditions

Months	pH	Temperature (°C)
January	8.1	0.3
February	8.0	0.1
March	8.1	1.5
April	8.3	9.3
May	8.2	15.0
June	8.2	19.4
July	8.2	23.5
August	8.2	24.3
September	8.3	20.2
October	8.3	14.2
November	8.3	8.0
December	8.3	0.8

Table 6: Wasteload allocations for ammonia nitrogen for the protection of aquatic life

Months	ADW-based*		AWW-based**	
	Acute (mg/l)	Chronic (mg/l)	Acute (mg/l)	Chronic (mg/l)
January	8.4	14.8	8.4	14.8
February	10.6	20.9	10.6	20.9
March	9.7	24.7	9.7	24.7
April	8.9	22.5	8.9	22.5
May	12.4	34.5	12.4	34.5
June	12.9	26.5	12.9	26.5
July	10.2	13.2	10.2	13.2
August	8.9	7.9	8.9	7.9
September	6.8	6.7	6.8	6.7
October	6.6	9.4	6.6	9.4
November	6.6	16.6	6.6	16.6
December	5.6	14.0	5.6	14.0

*: bases for concentration limits; **: bases for mass loading limits

Chloride and Sulfate:
The chloride and sulfate criteria became effective on November 11, 2009 and apply to all Class B waters. The default hardness for background and effluent is 200 mg/l.

Chloride criteria are functions of hardness and sulfate concentration, shown as follows:

$$\text{Acute criteria} = 287.8*(\text{Hardness})^{0.205797}*(\text{Sulfate})^{-0.07452}$$
$$\text{Chronic criteria} = 177.87*(\text{Hardness})^{0.205797}*(\text{Sulfate})^{-0.07452}$$

Sulfate criteria, shown in Table 7, are functions of hardness and chloride concentration and serve as both the acute and chronic criteria.

Table 7: Sulfate criteria

Hardness (mg/l as CaCO3)	Sulfate criteria (mg/l)		
	Chloride < 5 mg/l	5 mg/l <= Chloride < 25 mg/l	25 mg/l <= Chloride < 500 mg/l
< 100	500	500	500
100<=H<=500	500	(-57.478+5.79*H+54.163*Cl)*0.65	(1276.7+5.508*H-1.457*Cl)*0.65
H> 500	500	2,000	2,000

The acute criteria apply at the end of the ZID, and the chronic criteria apply at the end of the MZ. In this case, 17.5% of the 7Q10 flow and 1.75% of the 1Q10 flow in the Cedar River at the outfall are used as the MZ and the ZID, respectively.

The default chloride concentration for both background water and effluent is 34 mg/l, while the default sulfate concentration for both background water and effluent is 63 mg/l. The limits are calculated based on an assumed sampling frequency of 1/week.

Iron:
Iron criteria are defined in the issue paper "Iron Criteria and Implementation for Iowa's Surface Waters" (November 11, 2020). A dissolved iron criterion of 1 mg/L applies at the end of the ZID for both general use and designated use streams. Monthly limits are calculated for this facility. In this case, the ZID is 1.75% of the monthly 1Q10 flows in the Cedar River at the outfall. These limits appear as the "Iron (Dissolved)" limits on Page 1.

Additionally, the facility submitted the results on October 21, 2022 for an acute WET test conducted on September 21, 2022. The facility tested the survival rate of *Ceriodaphnia dubia* in the mixture consisting of 17% river water and 83% composite groundwater with spiked total iron concentrations up to 10 mg/l. The results showed a 100% survival for the *C. dubia* at the highest total iron concentration, with dissolved iron being non-detects (<0.036 mg/l). Based on the study, 10 mg/l of total recoverable iron is used as the limits for this facility, as concentrations higher than 10 mg/l are expected to cause objectionable color and violate narrative standards. These limits appear as the "Iron (Total Recoverable)" limits on Page 1.

TEH and Naphthalene:
Total extractable hydrocarbons (TEH) from diesel are assumed to consist of 0.2% naphthalene, 0.001% benzo(a)pyrene, 0.001% benz(a)anthracene, and 0.001% chrysene. TEH from waste oil are assumed to consist of 0.003% benzo(a)pyrene, 0.003% benz(a)anthracene, and 0.003% chrysene (and no naphthalene). These are based on DNR Tier 2 Site Cleanup Report Guidance, January 2021.

In the absence of numeric criteria, the narrative translated criterion for naphthalene is the 48-hour no observed effect level (NOEL) for the water flea, 0.480 mg/L (U.S. EPA, 1992) and applies at the end of the ZID, 1.75% of the 1Q10 flow in the Cedar River at the outfall.

Benzo(a)pyrene has numeric criteria for HH and B(WW-1) designated uses, and benz(a)anthracene and chrysene are explicitly included in the numeric criteria for polynuclear aromatic hydrocarbons (PAHs) for HH and B(WW-1) designated uses.

The WLAs for TEH are based on the more stringent limits to meet the narrative criteria for naphthalene or to meet the numeric criteria for PAHs and benzo(a)pyrene based on the assumed compositions of TEH_{diesel} and $TEH_{waste\ oil}$.

pH:
Iowa Water Quality Standards (IAC 567.61.3.(3).a.(2) and IAC 567.61.3.(3).b.(2)) require that pH in Class A or Class B waters "shall not be less than 6.5 nor greater than 9.0." The criteria apply at the end of the MZ, which is 17.5% of the 7Q10 flow in the Cedar River at the outfall.

TDS:
Effective November 11, 2009, the site-specific TDS approach is no longer applicable; instead, the new chloride and sulfate criteria became applicable. However, the TDS level should be controlled to a level such that the narrative criteria stated in IAC 567.61.3 are fulfilled.

4. PERMIT LIMITATIONS:
- *Based on the Year 2006 Water Quality Standards and 2002 Permit Derivation Procedure.*

The acute and chronic WLAs are used as the values for input into the current permit derivation procedure. Under the 2002 permit derivation procedure, only for toxic parameters is the monitoring frequency considered in the calculation of final limits. The water quality-based limits are shown on Pages 1 – 3 of this report.

SENT VIA ELECTRONIC MAIL

December 29, 2022

Ryan Boyce, Flood Control Systems Engineer
City of Cedar Rapids
500 15th Ave SW
Cedar Rapids, IA 52404

RE: Antidegradation Alternatives Analysis for Cedar Lake Dewatering – NPDES #5715007

Dear Mr. Boyce:

The Iowa Department of Natural Resources has completed a review of an antidegradation alternatives analysis dated November 2, 2022, which was received on December 12, 2022. The analysis was prepared by Stanley Consultants, Inc. in collaboration with HDR Engineering, Inc. on behalf of the City of Cedar Rapids. Public notice was completed on December 9, 2022, with no comments received. Per subrule 567 IAC 61.2(2) and the 2010 EPA-approved Iowa Antidegradation Implementation Procedure (AIP), the Department has made the following findings:

- The level of water quality necessary to protect applicable beneficial uses is fully maintained. Water quality shall not be degraded to a level that does not comply with the applicable Water Quality Standards (WQS).
    - The Department has reviewed the city's selected alternative which is to discharge up to 25 million gallons per day (MGD) of groundwater from thirty dewatering wells via outfall 001 under a new National Pollutant Discharge Elimination System (NPDES) permit. The dewatering will occur as part of the construction of approximately 2,200 linear feet of levee located along the west bank of Cedar Lake. We are in agreement with the applicant's analysis which concludes that the selected alternative assures the applicable beneficial use is fully maintained and that the water quality will not be degraded to a level that does not comply with the applicable WQS. See pages 2-1, 6-1 to 6-2, and 6-7 of the analysis submitted by applicant. The Department hereby adopts those portions of the applicant's analysis as its own.
- The highest statutory and regulatory requirements for new and existing point sources are achieved.
    - The Department is in agreement that the selected alternative will meet the highest statutory and regulatory requirements for this discharge. Page 6-7 and Table 6-2 of the analysis shows that Alternative 1 (Discharge into Cedar River) is practicable. The Department hereby adopts that portion of the analysis as its own.
- All cost-effective and reasonable BMPs for nonpoint source pollution control are implemented.
    - See Section 8 of the AIP.
- Allowing degradation of water quality is necessary and accommodates important economic or social development in the area where the surface water is located.

- The Department is in agreement with the applicant's determination that the selected alternative is the least degrading reasonable alternative. Further, no reasonable alternatives exist to prevent degradation. This portion of the analysis is found on pages 6-7 and 7-1 and in Table 6-2 and is hereby adopted by the Department as its own.
- The Department is in agreement that the applicant has presented the social and economic importance of the project in accordance with Section 3.3 of the AIP. This portion of the analysis is found on page 8-1 and is hereby adopted by the Department as its own.

Please keep this letter on file as proof of the Department's findings on the antidegradation alternatives analysis. The Department is proposing a new NPDES permit for the City of Cedar Rapids' proposed discharge of groundwater from thirty dewatering wells as part of the Cedar Lake levee construction project. The public comment period on the proposed permit begins today, December 29, 2022.

If you have any questions, you may contact me at 515-217-0873 or melinda.mccoy@dnr.iowa.gov.

Sincerely,

Melinda McCoy

Digitally signed by Melinda Mccoy
Date: 2022.12.29 09:54:01 -06'00'

Melinda McCoy
NPDES Section

C: DNR Field Office 1
Tyler Marshall, Stanley Consultants, Inc. (via email)
John Christiansen, HDR Engineering, Inc. (via email)