

# ENGINEERING REPORT SUMMARY: WASTEWATER TREATMENT FACILITY PROPOSED IMPROVEMENTS

Prepared for:

**Dexter, Missouri**

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Prepared by



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Exhibit 1 – Proposed Site Plan – Dexter West WWTF

Exhibit 2 – Proposed Force Main Alignment

Exhibit 3 – Proposed Site Plan – Dexter East WWTF

## **1.0 EXECUTIVE SUMMARY**

The City of Dexter is a community of approximately 7,927 people, as estimated by the 2020 census. The City of Dexter operates two wastewater treatment facilities (WWTFs), of which the Dexter East WWTF has had issues with not meeting permitted effluent requirements. An Abatement Order on Consent (AOC) has been entered into between the City of Dexter and MDNR for exceeding permitted effluent limitations for BOD, Ammonia as Nitrogen, and TSS. As part of the AOC, the City of Dexter is required to submit to MDNR a Facility Plan for review and approval by July 2024.

In addition to the need to come into compliance with permitted effluent requirements, the City of Dexter also anticipates a substantial increase in flows due to potential new industry and population growth on the east side of the city. Recent correspondence with MDNR indicates that due to impairments of the current discharging stream for the Dexter East WWTF, any increase in flows would require much more stringent effluent requirements that will likely limit future expansion for the East WWTF.

The Facility Plan, to be completed by July 2024, will recommend an alternative that involves pumping wastewater from the East WWTF to a new proposed mechanical plant at the West WWTF. The purpose of this report is to provide a summary of the recommended alternative in a phased approach with a cost estimate. The phased approach will allow the city to make immediate improvements at the West Lagoon Lift Station to address pressing needs in a manner that will facilitate the future use of these improvements with the construction of the new wastewater treatment plant.

## **2.0 EXISTING GENERAL CONDITIONS**

### **2.1 Population Served**

The Dexter West WWTF primarily serves residential customers with an ADF of approximately 0.619 MGD. The Dexter East WWTF has an ADF of approximately 0.878 MGD. Assuming that the customer in Dexter West uses the same volume of water as the customer in Dexter East, this equates to an average residential use of 189 gallons per person per day. Based on 189 gallons per person per day, it is estimated that the Dexter West WWTF serves a population of approximately 3,278 persons and the Dexter East WWTF serves a population of approximately 4,649 persons.

## **2.2 Median Household Income**

The median household income in 2020 was approximately \$42,521 based on the 2020 U.S. Census data. The low- and moderate-income percentage (LMI) was 64.24%.

## **3.0 WASTEWATER COLLECTION AND TREATMENT**

### **3.1 Collection System**

The City of Dexter's collection system consists of approximately 299,395 feet of sewer pipe made up of approximately 239,275 feet of vitrified clay pipe, 58,200 feet of PVC pipe, and 1,400 feet of ductile iron pipe. The collection system serves approximately 3,019 residential connections and 383 commercial connections. Flow from the Tyson Foods plant prior to plant closure was fed through a private force main directly into the Dexter East WWTF influent basin.

### **3.2 Dexter West WWTF**

The Dexter West WWTF is a lagoon system operated under the expired State of Missouri NPDES Permit No. MO-0043206. The permit establishes limits for the discharge of treated wastewater and disposal of sludge from the Dexter West WWTF.

The existing lagoon system consists of an influent lift station and a three-cell aerated lagoon. The WWTF is in the process of adding a UV disinfection system to meet *E. Coli* effluent requirements that became effective on July 1, 2023. The Dexter West WWTF is designed to treat 0.775 million gallons per day (MGD) with flows being primarily domestic in nature. Actual average daily flows (ADF) are approximately 0.619 MGD.

Figure 3-1. Dexter West WWTF Layout and Outfall Location



### 3.2.1 Summary of Receiving Water Quality

Dexter's West WWTF discharges into a tributary to Dudley Main Ditch. Dudley Main Ditch is a Class "C" stream, which indicates that it is a stream that may cease flow in dry periods but maintains permanent pools which support aquatic life.

Missouri Water Quality Standards indicate that Dudley Main Ditch has five beneficial use designations, including Irrigation, Livestock and Wildlife Protection, Protection of Warm Water habitat and Human Health Protection, Whole Body Contact Recreation (WBC-B), and Secondary Contact Recreation.

### 3.2.2 Current Effluent Limitations and Monitoring Requirements

The current City's NPDES permit establishes criteria for the required quality of effluent from the wastewater treatment process. Current effluent limits are based on an average plant design flow of 0.775 MGD.



**Table 3-1. Current Effluent Limitations and Monitoring Requirements**

Monthly Effluent Limitations and Monitoring Requirements

Effluent Parameter(s)	Units	Final Effluent Limitations			Monitoring Requirements	
		Daily Maximum	Weekly Average	Monthly Average	Measurement Frequency	Sample Type
Flow	MGD	*		*	once/month	24 hr. total
Biochemical Oxygen Demand (BOD <sub>5</sub> )	mg/L		45	30	once/month	composite**
Total Suspended Solids (TSS)	mg/L		45	30	once/month	composite**
<i>E. Coli</i> †	#/100mL		1030	206	once/week	grab
Ammonia as N (Apr 1 - Sep 30) (Oct 1 - Mar 31)	mg/L	5.0 10.1		1.3 2.7	once/month	composite**
pH - Units***	SU	Minimum 6.5		Maximum 9.0	once/month	grab

Quarterly Effluent Limitations and Monitoring Requirements

Effluent Parameter(s)	Units	Final Effluent Limitations			Monitoring Requirements	
		Daily Maximum	Weekly Average	Monthly Average	Measurement Frequency	Sample Type
Oil & Grease	mg/L	15		10	once/quarter	grab
Selenium, Total Recoverable	µg/L	*		*	once/quarter	composite**
Thallium, Total Recoverable	µg/L	*		*	once/quarter	composite**
Total Phosphorus	mg/L	*		*	once/quarter	composite**
Total Kjeldahl Nitrogen	mg/L	*		*	once/quarter	composite**
Nitrate + Nitrite	mg/L	*		*	once/quarter	composite**
BOD <sub>5</sub> (% Removal)	%			Minimum 85	once/quarter	calculated
TSS (% Removal)	%			Minimum 85	once/quarter	calculated

\*Monitoring requirement only.

\*\* A composite sample made up from a minimum of four grab samples collected within a 24 hour period with a minimum of two hours between each grab sample.

\*\*\* pH is measured in pH units and is not to be averaged.

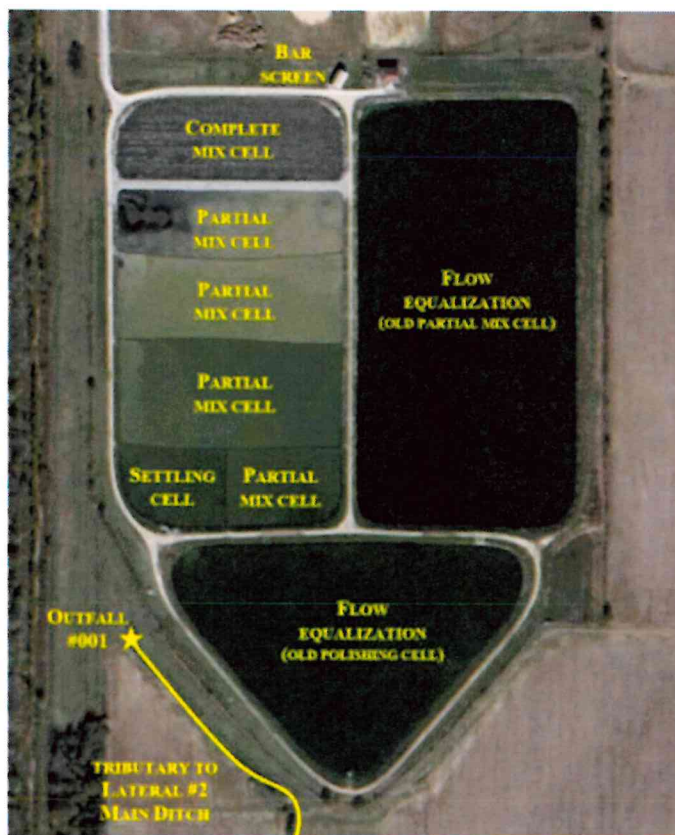
† Effluent limitations and monitoring requirements for *E. Coli* are applicable only during the recreational season from April 1 through October 31.

### 3.3 Dexter East WWTF

The Dexter East WWTF is a lagoon system operated under the expired State of Missouri NPDES Permit No. MO-0023213. The permit establishes limits for the discharge of treated wastewater and disposal of sludge from the Dexter East WWTF.

The existing lagoon system consists of bar screening, a six-cell activated sludge lagoon system, and two flow equalization lagoons. The Dexter East WWTF is designed to treat 1.8 MGD, of which around 50% of the flows came from the nearby Tyson Foods plant until its closure in October 2023. Prior to the Tyson Foods plant closure, the average daily flows (ADF) received at the East WWTF were approximately 1.6 MGD. Since the Tyson Foods plant closure, flows are now domestic in nature and average approximately 0.878 MGD. The City anticipates that a new industry with wastewater flows similar to the Tyson Foods plant will open up in the future.

Figure 3-2. Dexter East WWTF Layout and Outfall Location



#### 3.3.1 Summary of Receiving Water Quality

Dexter's East WWTF discharges into Presumed Use Streams. Presumed Use Streams is a Class "C" stream, which indicates that it is a stream that may cease flow in dry periods but



maintains permanent pools which support aquatic life. Presumed Use Streams is a tributary of Lateral #2 Main Ditch, which is a 303(d) listed stream for ammonia and dissolved oxygen. The source(s) of the impairments are unknown. Lateral #2 Main Ditch is a Class "P" stream, which indicates that it is a stream that maintains permanent flow even in drought periods.

Missouri Water Quality Standards indicate that Presumed Use Streams has five beneficial use designations, including Irrigation, Livestock and Wildlife Protection, Protection of Warm Water habitat and Human Health Protection, Whole Body Contact Recreation That Supports Swimming (WBC-A), and Secondary Contact Recreation.

### 3.3.2 Current Effluent Limitations and Monitoring Requirements

The current City's NPDES permit establishes criteria for the required quality of effluent from the wastewater treatment process. Current effluent limits are based on an average plant design flow of 1.8 MGD.

**Table 3-2. Current Effluent Limitations and Monitoring Requirements**

Monthly Effluent Limitations and Monitoring Requirements

Effluent Parameter(s)	Units	Final Effluent Limitations			Monitoring Requirements	
		Daily Maximum	Weekly Average	Monthly Average	Measurement Frequency	Sample Type
Flow	MGD	*		*	once/week	24 hr. total
Biochemical Oxygen Demand (BOD <sub>5</sub> )	mg/L		45	30	once/week	grab
Total Suspended Solids (TSS)	mg/L		45	30	once/week	grab
<i>E. Coli</i> <sup>†</sup>	#/100mL		1030	206	once/week	grab
Ammonia as N (Apr 1 - Sep 30) (Oct 1 - Mar 31)	mg/L	2.6 4.9		1.4 3.0	once/week	grab
pH - Units***	SU	Minimum 6.5		Maximum 9.0	once/month	grab
BOD <sub>5</sub> (% Removal)	%			Minimum 85	once/month	calculated
TSS (% Removal)	%			Minimum 85	once/month	calculated

Quarterly Effluent Limitations and Monitoring Requirements

Effluent Parameter(s)	Units	Final Effluent Limitations			Monitoring Requirements	
		Daily Maximum	Weekly Average	Monthly Average	Measurement Frequency	Sample Type
Oil & Grease	mg/L	15		10	once/quarter	grab
Selenium, Total Recoverable	µg/L	8.3		4.0	once/quarter	grab
Zinc, Total Recoverable	µg/L	180.7		53.5	once/quarter	grab
Total Phosphorus	mg/L	*		*	once/quarter	grab
Total Nitrogen	mg/L	*		*	once/quarter	grab
Total Hardness	mg/L	*		*	once/quarter	grab
Cadmium, Total Recoverable	µg/L	*		*	once/quarter	grab
Iron, Total Recoverable	µg/L	*		*	once/quarter	grab
Total Hardness	mg/L	*		*	once/quarter	grab

Whole Effluent Toxicity Effluent Limitations and Monitoring Requirements

Effluent Parameter(s)	Units	Final Effluent Limitations			Monitoring Requirements	
		Daily Maximum	Weekly Average	Monthly Average	Measurement Frequency	Sample Type
Acute Whole Effluent Toxicity	T <sub>u</sub> <sub>a</sub>	*			once/year	grab
Chronic Whole Effluent Toxicity	T <sub>u</sub> <sub>c</sub>	*			once/permit cycle	grab

\*Monitoring requirement only.

\*\* A composite sample made up from a minimum of four grab samples collected within a 24 hour period with a minimum of two hours between each grab sample.

\*\*\* pH is measured in pH units and is not to be averaged.

† Effluent limitations and monitoring requirements for *E. Coli* are applicable only during the recreational season from April 1 through October 31.

## 4.0 FUTURE CONDITIONS

### 4.1 Population Projections

Recent trends in population growth in Dexter will serve as the primary indicator of future growth patterns, and therefore future wastewater flows. The past 12 decades were analyzed for future population projections.